GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

PROJECT ADMINISTRATION DATA SHEET

[x] ORIGINAL [ ] REVISION NO. _____

Project No. G-41-D05 (subproj. is G-32-D05, Biology) ~~GTRI~~/GIT DATE 5/5/83

Project Director: Dr. Roger M. Wartell School/~~xxx~~ Physics

Sponsor: National Institute of Allergy and Infectious Diseases (DHHS,PHS)

Type Agreement: Grant #5K04 AI00332-05 (year 05)

Award Period: From 7/1/83 To 6/30/84 (Performance) 9/30/84 (Reports)

Sponsor Amount: Total Estimated: $ 29,403 Funded: $ 9/30/84

Cost Sharing Amount: $ None Cost Sharing No: N/A

Title: Interaction of RNA Polymerase with DNA Sites

ADMINISTRATIVE DATA OCA Contact William Brown Ext. 4820

1) Sponsor Technical Contact: Program Official
Irving F. DeLappe, Ph.D. Chief
Molecular Microbiology & Parasitology
NIAID
Bethesda, MD 20014

2) Sponsor Admin/Contractual Matters: Grants Mgt.
Gary E. Thompson/Todd Ball
Grants Management Branch
EAP-NIAID
Bethesda, MD 20014

(301) 496-7075

Defense Priority Rating: None

Military Security Classification: None

(or) Company/Industrial Proprietary: _____

RECEIVED MAY 1983 Research Reports Office

RESTRICTIONS

See Attached NIH Supplemental Information Sheet for Additional Requirements.

Travel: Foreign travel must have prior approval – Contact OCA in each case. Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with GIT, but none proposed.

COMMENTS:

Summary of funds distribution:

	New Funds	Balance from year 04	Total Budget
~~G-41-D05~~	$27,443	$1,960	$29,403
Sub.G-32-D05	9,148	653	9,801
	$36,591	$2,613	$39,204

COPIES TO:

Research Administrative Network
Research Property Management
Accounting
Procurement/EES Supply Services
Research Security Services
Reports Coordinator (OCA)
GTRI
Library
Research Communications (2)
Project File
Other Wartell
Other I. Newton

FORM OCA 4:781 (Rev 982)

GEORGIA INSTITUTE OF TECHNOLOGY OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 10/30/84

Project No. G-41-D05 School/~~XXX~~ Physics

Includes Subproject No.(s) G-32-D05

Project Director(s) Dr. Roger M. Wartell ~~GTRI~~ / GIT

Sponsor National Institute of Allergy and Infectious Diseases (DHHS,PHS)

Title "Interaction of RNA Polymerase with DNA Sites"

Effective Completion Date: 6/30/84 (Performance) 9/30/84 (Reports)

Grant/Contract Closeout Actions Remaining:

- [ ] None
- [X] Final Invoice or Final Fiscal Report
- [X] Closing Documents
- [X] Final Report of Inventions send patent questionaire
- [X] Govt. Property Inventory & Related Certificate
- [ ] Classified Material Certificate
- [ ] Other

Continues Project No. G-41-D04 Continued by Project No.

COPIES TO:

Project Director
Research Administrative Network
Research Property Management
Accounting
Procurement/EES Supply Services
~~Research Security Services~~
Reports Coordinator (OCA)
Legal Services

Library
GTRI
Research Communications (2)
Project File
Other A. Jones; M. Heyser

Final Progress Report

for

National Institute of Health Research Grant

Title: "Interaction of RNA Polymerase with DNA Sites"

Grant No.: AI-00 332

Period of Grant: 7/1/79 - 6/30/84

Roger M. Wartell

School of Physics

Georgia Institute of Technology

Atlanta, Georgia 30332

Final Progress Report

The objective of the research was to advance our understanding of the physical aspects of site specific binding between gene regulatory proteins and DNA. DNA restriction fragments containing the transcription initiation region, i.e., the promoter, of the E. coli lactose operon were studied by Raman spectroscopy, and DNA denaturation. In addition studies were carried out on the binding of the catabolite activator protein, CAP, to its primary site in the lactose promoter. Approximately 2 mgs. of a 64 bp. DNA restriction fragment containing the CAP binding site and a neighboring 80 bp. DNA were isolated. Several studies were carried out with these DNAs. Raman spectra were obtained from the DNAs in several solvents and at several temperatures. Quantatative analysis of the Raman spectra of these and seven other DNAs were made to determine if the CAP binding site has unique conformational characteristics. The results show that the 61 bp. lac DNA has a Raman spectra consistent with a B conformation DNA. No unusual features were observed relative to other DNAs of similar G.C content. An unexpected finding was that all DNAs examined exhibited a Raman band of low intensity at a frequency associated with an A form C3'-endo sugar pucker. This suggests that DNA in solution is in a dynamic equilibrium between C2' endo and C3' endo sugar conformations with C2' endo being dominant. This work was presented at the International Biophysics Congress and a manuscript is in preparation. Studies on CAP binding to the 61 bp. lac DNA and a 144 bp. lac DNA are being carried out. Previous work by Wu and Crothers indicated that CAP bends or kinks DNA at its specific binding site. We have examined the effect of CAP binding on the ability of DNA ligase to convert linear 144 bp. lac DNA to a closed circle. Results show that closure of the 144 dimer (288 bp.) is markedly enhanced by the presence of CAP. This work has the potential to determine the

bending angle in the CAP DNA complex, and is being pursued.

Additionally, DNA denaturation studies have shown that CAP enhances the thermal stability of the 61 bp. lac DNA by $15^{o}C$ at saturating concentrations. This is the first conclusive proof that CAP thermally stabilizes the DNA region to which it binds.

Raman spectroscopy has also been employed to investigate DNA sequences which can undergo the B to Z transition. The transition of $(dG.dC)_n.(dG\text{-}dC)_n$ induced by increasing NaCl was followed. The results indicate that base unstacking preceeds a highly cooperative change in the 1093 cm^{-1} PO_2^- vibration. The temperature induced transition of $(dG\text{-}dmeC)_n.(dG\text{-}dmeC)_n$ is currently being examined. These studies will provide information on the pathway for the B $\rightleftharpoons$ Z transition.

Publications in 1983 and 1984

1. "Influence of Base Pair Changes and Cooperativity Parameters on the Melting of Short DNAs," Biopolymers 22, 1409, 1983.
2. "Raman Spectroscopy Study of the B-Z Transitions in $(dG\text{-}dC)_n$ $d(G\text{-}C)_n$ and a DNA Restriction Fragment," J. Biomole. Struct. and Dynamics 1, 83, 1983.
3. "A Raman Spectroscopy Analysis of Promoter and Non-Promoter DNA Fragments," manuscript in preparation.